REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Made technical changes to table I. Corrected figure 1 to change a 28-lead package to a 24-lead package. Editorial changes throughout.	91-05-07	W. Heckman
B	Added case outline X. Editorial changes throughout.	93-07-30	K. Cottongim
C	Table I; added footnote 2 for the I_{OS}, S_O, t_{PWH}, and t_{PWL} tests. Made correction to the clock input test in table I. Renumbered the footnotes in table I. Figure 1; Corrected the case outline Y side view. Updated drawing to reflect the latest requirements of MIL-PRF-38534. -sld	03-10-31	Raymnod Monnin

REV																				
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REV STATUS	REV	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
OF SHEETS	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	

PMIC N/A

PREPARED BY
Steve Duncan

CHECKED BY
Robert M. Heber

APPROVED BY
William K. Heckman

DRAWING APPROVAL DATE
89-11-17

REVISION LEVEL
C

DEFENSE SUPPLY CENTER COLUMBUS
COLUMBUS, OHIO 43216
http://www.dscc.dla.mil

STANDARD MICROCIRCUIT DRAWING

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

AMSC N/A

MICROCIRCUIT, HYBRID, LINEAR, ANALOG TO DIGITAL CONVERTER, HIGH SPEED, 12-BIT

SIZE	CAGE CODE	
A	**67268**	**5962-89584**

SHEET 1 OF 14

1. SCOPE

1.1 Scope. This drawing describes device requirements for class H hybrid microcircuits in accordance with MIL-PRF-38534.

1.2 PIN. The PIN shall be as shown in the following example:

5962-89584	01	X	X
Drawing number	Device type (see 1.2.1)	Case outline (see 1.2.2)	Lead finish (see 1.2.3)

1.2.1 Device type(s). The device type(s) identify the circuit function as follows:

Device type	Generic number	Circuit function
01	MN5210	A/D converter, high speed, 12-bit, 0 V to -10 V internal reference
02	MN5213	A/D converter, high speed, 12-bit, 0 V to -10 V external reference
03	MN5211	A/D converter, high speed, 12-bit, -5 V to +5 V internal reference
04	MN5214	A/D converter, high speed, 12-bit, -5 V to +5 V external reference
05	MN5212	A/D converter, high speed, 12-bit, -10 V to +10 V internal reference
06	MN5215	A/D converter, high speed, 12-bit, -10 V to +10 V external reference
07	MN5216	A/D converter, high speed, 12-bit, 0 V to +10 V internal reference

1.2.2 Case outline(s). The case outline(s) are as designated in MIL-STD-1835 and as follows:

Outline letter	Descriptive designator	Terminals	Package style
X	See figure 1	24	Dual-in-line package
Y	See figure 1	24	Dual-in-line package

1.2.3 Lead finish. The lead finish shall be as specified in MIL-PRF-38534.

1.3 Absolute maximum ratings. 1/

Positive supply voltage (V_{CC})	+18 V dc
Negative supply voltage (V_{EE})	-18 V dc
Logic supply voltage (V_{LOG})	+7 V dc
Analog input voltage	±25 V dc
Digital input voltage	+5.5 V dc
Digital output voltage	$+V_{LOG}$
Reference input voltage (V_{REF})	0 to -15 V dc (Ext. ref. only)
Lead temperature (soldering, 60 seconds)	+300°C
Junction temperature (T_J)	+175°C
Thermal resistance:	
Junction-to-case (θ_{JC})	6°C/W
Junction-to-ambient (θ_{JA})	33°C/W

1/ Stresses above the absolute maximum ratings may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.

1.4 Recommended operating conditions.

Positive supply voltage range (V_{CC})	+14.55 V dc to +15.45 V dc
Negative supply voltage range (V_{EE})	-14.55 V dc to -15.45 V dc
Logic supply voltage range (V_{LOG})	+4.5 V dc to +5.5 V dc
External reference (V_{REF}):	
Device types 02, 04, and 06	-10.0 V dc
Ambient operating temperature range (T_A)	-55°C to +125°C

2. APPLICABLE DOCUMENTS

2.1 Government specification, standards, and handbooks. The following specification, standards, and handbooks form a part of this drawing to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

SPECIFICATION

DEPARTMENT OF DEFENSE

MIL-PRF-38534 - Hybrid Microcircuits, General Specification for.

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-883 - Test Method Standard Microcircuits.
MIL-STD-1835 - Interface Standard Electronic Component Case Outlines.

HANDBOOKS

DEPARTMENT OF DEFENSE

MIL-HDBK-103 - List of Standard Microcircuit Drawings.
MIL-HDBK-780 - Standard Microcircuit Drawings.

(Unless otherwise indicated, copies of the specification, standards, and handbook are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.).

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Item requirements. The individual item performance requirements shall be in accordance with MIL-PRF-38534 and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38534 and herein.

3.2.1 Case outline(s). The case outline(s) shall be in accordance with 1.2.2 herein and figure 1.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

3.2.3 Logic diagram(s). The logic diagram(s) shall be as specified on figure 3.

3.2.4 Timing diagram. The timing table shall be as specified on figure 4.

3.2.5 Digital output codes. The digital output codes shall be as specified on figure 5.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full specified operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are defined in table I.

3.5 Marking of device(s). Marking of device(s) shall be in accordance with MIL-PRF-38534. The device shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's vendor similar PIN may also be marked.

3.6 Data. In addition to the general performance requirements of MIL-PRF-38534, the manufacturer of the device described herein shall maintain the electrical test data (variables format) from the initial quality conformance inspection group A lot sample, for each device type listed herein. Also, the data should include a summary of all parameters manually tested, and for those which, if any, are guaranteed. This data shall be maintained under document revision level control by the manufacturer and be made available to the preparing activity (DSCC-VA) upon request.

3.7 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to supply to this drawing. The certificate of compliance (original copy) submitted to DSCC-VA shall affirm that the manufacturer's product meets the performance requirements of MIL-PRF-38534 and herein.

3.8 Certificate of conformance. A certificate of conformance as required in MIL-PRF-38534 shall be provided with each lot of microcircuits delivered to this drawing.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38534 or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $-55°C \le T_C \le +125°C$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Power supply current from V_{CC}	I_{CC}	V_{CC} = 15.45 V, V_{IN} (analog) = max positive input voltage +0.5 V, output code = 0000 0000 0000	1,2,3	All	3	28	mA
		V_{CC} = 15.45 V, V_{IN} (analog) = max negative input voltage -0.5 V, output code = 1111 1111 1111			3	28	
Power supply current from V_{EE}	I_{EE}	V_{EE} = -15.45 V, V_{IN} (analog) = max positive input voltage +0.5 V, output code = 0000 0000 0000	1,2,3	01,03, 05,07	-1	-25	mA
		V_{EE} = -15.45 V, V_{IN} (analog) = max negative input voltage -0.5 V, output code = 1111 1111 1111		02,04, 06	-1	-25	
Power supply current from V_{LOG}	I_{LOG}	V_{LOG} = 5.5 V, V_{IN} (analog) = max positive input voltage +0.5 V, output code = 0000 0000 0000	1,2,3	All	1	42	mA
		V_{LOG} = 5.5 V, V_{IN} (analog) = max negative input voltage -0.5 V, output code = 1111 1111 1111			1	42	
Reference input	I_{REF}	V_{REF} = -10 V, V_{IN} (analog) = max positive input voltage +0.5 V	1,2,3	02,04, 06	-0.1	-2	mA
		V_{REF} = -10 V, V_{IN} (analog) = max negative input voltage -0.5 V			-0.1	-2	
Power dissipation	P_D		1,2,3	All		915	mW
Input low current	I_{IL}	V_{IN} (Logic) = 0.3 V	1,2,3	All	-0.05	-0.4	mA
Input high current	I_{IH}	V_{IN} (Logic) = 2.4 V	1,2,3	All	0	40	µA
		V_{IN} (Logic) = 5.5 V			0	1	mA
Output short circuit 2/	I_{OS}	V_{IN} (Logic) = max negative input voltage -0.5 V, output code = 1111 1111 1111, (test one output at a time)	1,2,3	All	-4	-35	mA
Output logic voltage levels	V_{OH}	I_L = -80 µA	1,2,3	All	2.4		V
	V_{OL}	I_L = 3.2 mA				0.3	
Serial/parallel 2/	S_O	Set V_{IN} for output code = 1000 0000 0000, serial output code exactly equals parallel output code	4,5,6	All	PASS/FAIL		

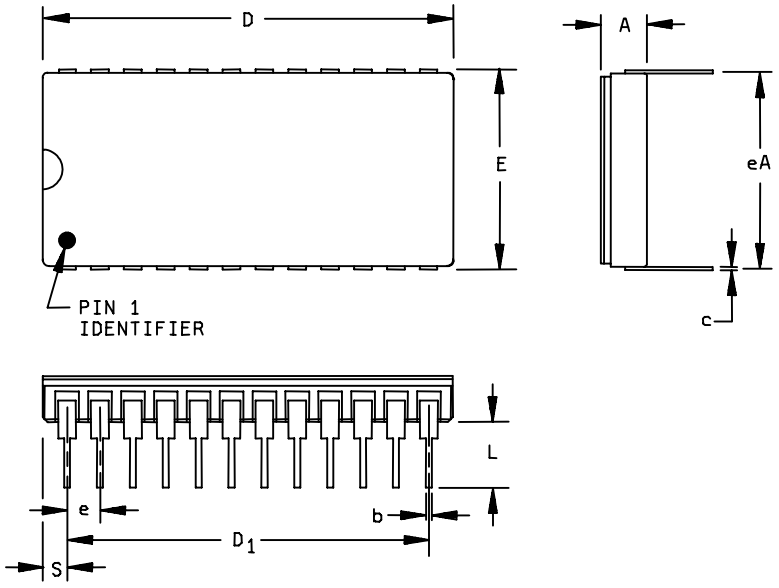
See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55°C \le T_C \le +125°C$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Bit transition linearity error (end-point) 3/	T_{LE}	ΔV_{CC} (max) = ΔV_{EE} (max) = ±.015, abbreviated test	4,5,6	All	-0.50	+0.50	LSB
Major carry errors	M_{CE}	ΔV_{CC} (max) = ΔV_{EE} (max) = ±.015, 800-7FF (HEX) to 002-001 (HEX)	4,5,6	All	-0.9	+1.5	LSB
		7FF-&FE (HEX) to 001-000 (HEX)			-0.9	+1.5	
Power supply sensitivity to V_{CC}	$+P_{SS1}$	V_{CC} = +14.55 V, +15.45 V, output transition = 0000 0000 000∗ 4/	4,5,6	All	-0.02	+0.02	%FSR/% V_S
Power supply sensitivity to V_{EE}	$-P_{SS1}$	V_{EE} = -14.55 V, -15.45 V, output transition = 0000 0000 000∗ 4/	4,5,6	All	-0.05	+0.05	%FSR/% V_S
Power supply sensitivity to V_{LOG}	$+P_{SS2}$	V_{LOG} = +4.5 V, +5.5 V, output transition = 0000 0000 000∗ 4/	4,5,6	All	-1	+1	%FSR/% V_S
Bit transition linearity error (end-point)	T_{LE}	ΔV_{CC} (max) = ΔV_{EE} (max) = ±.015, all codes test	4,5,6	All	-0.75	+0.75	LSB
Conversion time	t_C	5/	9,10,11	All		13	µs
Clock input 2/	t_{PWH}	Logic 1 = 2.4 V	9,10,11	All	175		ns
	t_{PWL}	Logic 0 = 0.3 V			125		

1/ Unless otherwise specified V_{CC} = +15 V dc ±5 percent, V_{EE} = -15 V dc ±5 percent, and V_{LOG} = +5 V dc ±10 percent.
2/ Guaranteed by design, but not tested.
3/ The abbreviated bit transition linearity error test shown for subgroups 4, 5, and 6 shall represent the minimum number of tests required. The manufacturer shall add additional tests and/or calculations to assure that the worst positive and negative error values, as determined by the abbreviated test, are within 150 milli LSB, of the worst positive and negative values, as determined by the all codes test for subgroups 7 and 8.
4/ ∗ represents the transition point between two adjacent code-words (i.e.: 0000 0000 0000 and 0000 0000 0001 or 0111 1111 1111 and 1000 0000 0000).
5/ The listed conversion time is for test purposes and is based on a maximum clock frequency of 923 kHz.

Case outline X.

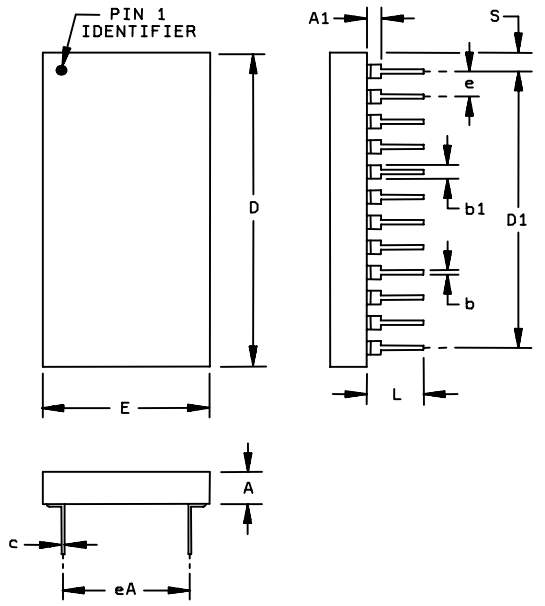


Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A		4.65		.183
b	0.381	0.483	.015	.019
c	0.203	0.305	.008	.012
D	31.24	32.26	1.230	1.270
D_1	27.81	28.07	1.095	1.105
E		15.75		.620
e	2.54 BSC		.100 BSC	
eA	15.11	15.37	.595	.605
L	4.45	5.21	.175	.205
S	1.65	2.03	.065	.080

NOTES:
1. The U. S. Government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall take precedence.

FIGURE 1. Case outline(s).

Case outline Y.



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	3.05	4.32	.120	.170
A1	0.38	0.89	.015	.035
b	0.41	0.51	.016	.020
b1	0.89		.035	
c	0.23	0.30	.009	.012
D	32.38	33.40	1.275	1.315
D1	27.81	28.07	1.095	1.105
E	19.56	20.57	.770	.810
e	2.54 BSC		.100 BSC	
eA	15.11	15.37	.595	.605
L	5.08	5.84	.200	.230
S	2.20	2.92	.087	.115

NOTES:
1. The U. S. Government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall take precedence.

FIGURE 1. Case outline - Continued.

Device types	All
Case outlines	X and Y
Terminal number	Terminal symbol
1	Start convert
2	V_{LOG}
3	Serial output
4	Bit 6
5	Bit 5
6	Bit 4
7	Bit 3
8	Bit 2
9	Bit 1 (MSB)
10	No connection
11	Ground (see note 1)
12	V_{REF} (see note 2)
13	V_{EE}
14	Analog input
15	V_{CC}
16	Bit 12 (LSB)
17	Bit 11
18	Bit 10
19	Bit 9
20	Bit 8
21	Bit 7
22	Status (E.O.C)
23	Ground (see note 1)
24	Clock input

NOTES:

1. The units two ground pins (pins 11 and 23) must be connected together as close to the package as possible, and preferably should be connected to a large analog ground plane underneath the package. If these commons must be run separately, a non-polarized 0.01µF bypass capacitor should be connected between pins 11 and 23 as close to the unit as possible and wide conductor runs should be employed.
2. For device types 02, 04, 06, a -10 V external reference is applied to pin 12. No other connection shall be made to pin 12. For device types 01, 03, 05, and 07 terminal is reference output of -6.3 V.

FIGURE 2. Terminal connections.

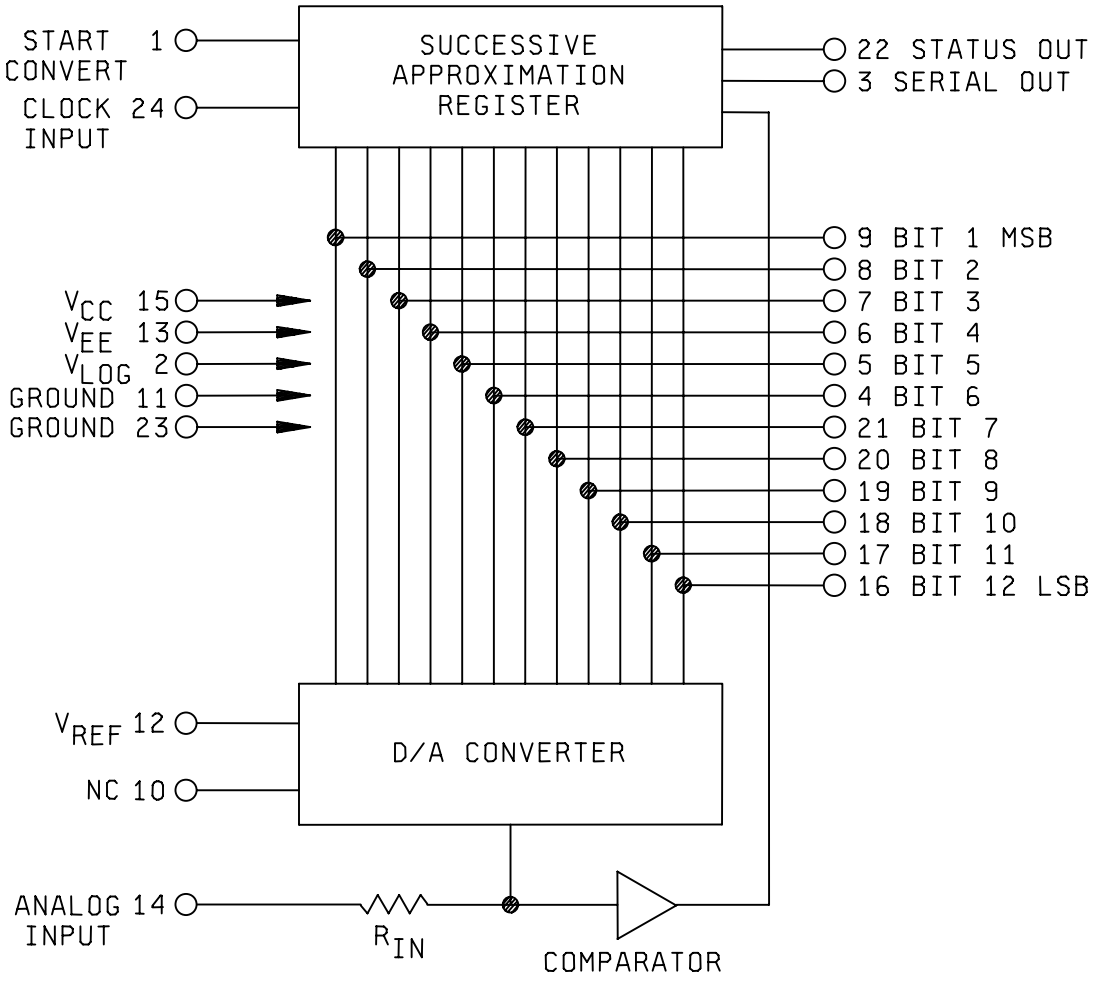
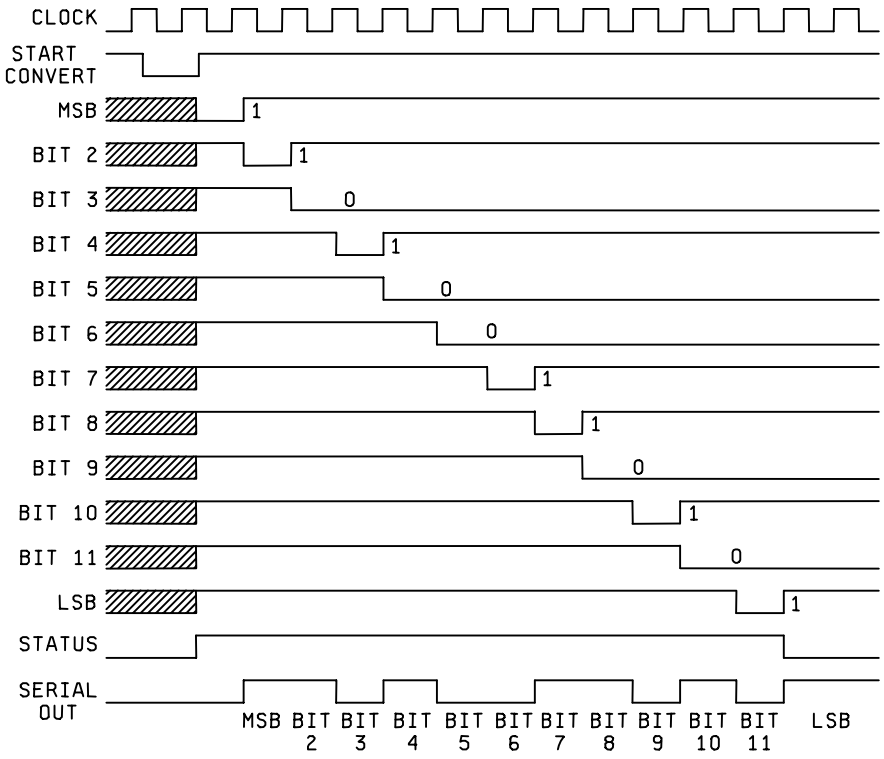


FIGURE 3. Logic diagram.



NOTES:

1. Operation shown is for the digital word 1101 0011 0101 which corresponds to 1.7432 V on the 0 to +10 V input range, Device type 07.
2. Conversion time is defined as the width of the status (E.O.C.) pulse.
3. The converter is reset (MSB = "0", all other bits = "1") by holding the start convert low during a low to high clock transition. The start convert must be low for a minimum of 25 ns prior to the clock transition. Holding the start low will hold the converter in the reset state. Actual conversion will begin on the next rising clock edge after the start has returned high.
4. The delay between the resetting clock edge and status actually rising to a "1" is 160 ns maximum.
5. The start convert may be brought low at any time during a conversion to reset and begin converting again.
6. Both serial and parallel data bits become valid on the same rising clock edges. Serial data is valid on subsequent falling clock edges, and these edges can be used to clock serial data into receiving registers.
7. Output data will be valid 30 ns (maximum) after the status (E.O.C.) output has returned low. Parallel output data will remain valid and the status output low until another conversion is initiated.
8. For continuous conversion, connect the status output (pin 22) to the start convert input (pin 1).
9. When the converter is initially "powered up" it may come on at any point in the conversion cycle.

FIGURE 4. Timing diagram.

Analog input				Digital output
Device types 01 and 02	Device types 03 and 04	Device types 05 and 06	Device type 07	(MSB) (LSB)
0.0000 V	+5.0000 V	+10.0000 V	+10.0000 V	0000 0000 0000
0.0024 V	+4.9976 V	+9.9951 V	+9.9976 V	0000 0000 000∗ See Note
-4.9976 V	+0.0024 V	+0.0049 V	+5.0024 V	0111 1111 111∗ See Note
-5.0000 V	0.0000 V	0.0000 V	+5.0000 V	**** **** **** See Note
-5.0024 V	-0.0024 V	-0.0049 V	+4.9976 V	1000 0000 000∗ See Note
-9.9976 V	-4.9976 V	-9.9951 V	+0.0024 V	1111 1111 111∗ See Note
-10.0000 V	-5.0000 V	-10.0000 V	0.0000 V	1111 1111 1111

NOTE: Voltages given are the theorectical values for the transitions indicated. Ideally with the converter continously converting, the output bits indicated as ∗ will change "1" to "0" or "0" to "1" as the input voltage passes through the level indicated.

FIGURE 5. Digital output codes.

TABLE II. Electrical test requirements.

MIL-PRF-38534 test requirements	Subgroups (in accordance with MIL-PRF-38534, group A test table)
Interim electrical parameters	1,4
Final electrical parameters	1*,2,3,4,5,6,7,8,9,10,11
Group A test requirements	1,2,3,4,5,6,7,8,9,10,11
Group C end-point electrical parameters	1,2,3
End-point electrical parameters for Radiation Hardness Assurance (RHA) devices	Not applicable

* PDA applies to subgroup 1.

4.2 Screening. Screening shall be in accordance with MIL-PRF-38534. The following additional criteria shall apply:

a. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DSCC-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1015 of MIL-STD-883.

(2) T_A as specified in accordance with table I of method 1015 of MIL-STD-883.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Conformance and periodic inspections. Conformance inspection (CI) and periodic inspection (PI) shall be in accordance with MIL-PRF-38534 and as specified herein.

4.3.1 Group A inspection (CI). Group A inspection shall be in accordance with MIL-PRF-38534 and as follows:

a. Tests shall be as specified in table II herein.

4.3.2 Group B inspection (PI). Group B inspection shall be in accordance with MIL-PRF-38534.

4.3.3 Group C inspection (PI). Group C inspection shall be in accordance with MIL-PRF-38534 and as follows:

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test, method 1005 of MIL-STD-883.

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DSCC-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1005 of MIL-STD-883.

(2) T_A as specified in accordance with table I of method 1005 of MIL-STD-883.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

4.3.4 Group D inspection (PI). Group D inspection shall be in accordance with MIL-PRF-38534.

4.3.5 Radiation Hardness Assurance (RHA) inspection. RHA inspection is not currently applicable to this drawing.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38534.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated as specified in MIL-PRF-38534.

6.4 Record of users. Military and industrial users shall inform Defense Supply Center Columbus when a system application requires configuration control and the applicable SMD. DSCC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronic devices (FSC 5962) should contact DSCC-VA, telephone (614) 692-0544.

6.5 Comments. Comments on this drawing should be directed to DSCC-VA, Columbus, Ohio 43216-5000, or telephone (614) 692-1081.

6.6 Sources of supply. Sources of supply are listed in MIL-HDBK-103 and QML-38534. The vendors listed in MIL-HDBK-103 and QML-38534 have submitted a certificate of compliance (see 3.7 herein) to DSCC-VA and have agreed to this drawing.

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 03-10-31

Approved sources of supply for SMD 5962-89584 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38534 during the next revisions. MIL-HDBK-103 and QML-38534 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DSCC-VA. This bulletin is superseded by the next dated revisions of MIL-HDBK-103 and QML-38534.

Standard microcircuit drawing PIN 1/	Vendor CAGE number	Vendor similar PIN 2/
5962-8958401XA	3/	MN5210H/B
5962-8958401YA	3/	MN5210H/B
5962-8958402XA	3/	MN5213H/B
5962-8958402YA	50507	MN5213MYA
5962-8958402YC	50507	MN5213MYC
5962-8958403XA	50507	MN5211MXA
5962-8958403XC	50507	MN5211MXC
5962-8958403YA	50507	MN5211MYA
5962-8958403YC	50507	MN5211MYC
5962-8958404XA	3/	MN5214H/B
5962-8958404YA	50507	MN5214MYA
5962-8958404YC	50507	MN5214MYC
5962-8958405XA	50507	MN5212MXA
5962-8958405XC	50507	MN5212MXC
5962-8958405YA	50507	MN5212MYA
5962-8958405YC	50507	MN5212MYC
5962-8958406XA	50507	MN5215MXA
5962-8958406XC	50507	MN5215MXC
5962-8958406YA	50507	MN5215MYA
5962-8958406YC	50507	MN5215MYC
5962-8958407XA	50507	MN5216MXA
5962-8958407XC	50507	MN5216MXC
5962-8958407YA	50507	MN5216MYA
5962-8958407YC	50507	MN5216MYC

1/ The lead finish shown for each PIN representing a hermetic package is the most readily available from the manufacturer listed for that part. If the desired lead finish is not listed contact the Vendor to determine its availability.
2/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.
3/ This device is no longer available.

Vendor CAGE number	Vendor name and address
50507	Micro Networks Corporation 324 Clark Street Worcester, MA 01606